3.15 HAZARDS AND HAZARDOUS MATERIALS

This section describes known soil contamination on the Dutch Slough Restoration Project and Related Projects sites as a result of past agricultural uses. It is based on Phase I and II Environmental Site Assessments (ESAs) for the Burroughs, Gilbert, and State-owned portions of the Emerson parcels and on soil sampling performed on the adjacent Ironhouse parcel. The Ironhouse parcel is the potential source for imported soils to be used as fill if Alternatives 2 or 3 are carried out. It should be noted that no ESA has been conducted for the City Community Park Project site due to access limitations. Issues associated with groundwater quality and groundwater contamination are addressed in Section 3.2, Water Quality.

3.15.1 Affected Environment

Phase I Environmental Site Assessments (Phase I ESAs) for the Emerson, Gilbert and Burroughs Parcels

Phase I Environmental Site Assessments (Phase I ESA) were performed in January 2003, for the Emerson, Gilbert and Burroughs Parcels. The Site Assessments included a review of historical records and aerial photographs for each property and of the regulatory databases maintained by county, state and federal agencies, in a search for potential hazards. In addition, a follow-up, Phase I/II study was performed of the soil and groundwater in and around the six inactive and one active gas well on the Burroughs Property, and another follow-up soil and groundwater testing report was conducted in July 2003 for the State-owned portions of the Emerson properties. The Department of Water Resources (DWR) reviewed these documents in various memoranda in 2003 and concluded that the landowners had complied with their recommendations.

EMERSON PARCEL

The Phase I ESA, dated January 29, 2003, was performed by ENGEO Inc. on behalf of Mr. Stan Emerson (ENGEO, Inc. 2003a). Contra Costa County Building Inspection Department, Community Development Department and Assessors Office were contacted for information about the property. Historical aerial photographs dating back to 1953 were reviewed. The ESA noted that the property was used for cattle grazing as part of the Emerson Dairy operations. The only developments on the property were livestock pens. There was also a small vineyard.

The Phase I ESA included a search for of records pertaining to the property in the following agency databases: Contra Costa County Hazardous Materials Division; California Environmental Protection Agency (CAL-EPA) Department of Toxic Substances Control (DTSC); State Regional Water Resources Control Board (SRWCB); California Regional Water Quality Control Board (RWQCB); State Division of Oil and Gas (DOG); Environmental Protection Agency (Region IX). Maps of the geologic, hydrologic and topographic characteristics of the site also were reviewed. The site also was observed for visible signs of contamination and past owners and occupants were interviewed.

County, state and federal records and databases were checked to see if there were any National Priority List (NPL) sites, Resource Conservation and Recovery Act (RCRA) treatment/storage/disposal facilities, or state NPL/CERCLIS equivalent sites within one mile of the property. No registered hazardous waste generators were documented within a quarter mile of the

property. Four registered underground storage tank facilities (UST) were listed within a quarter mile of the property and two of these were listed as active. One leaking underground storage tank site at Food and Liquor #86 at 101 Cypress Road is within a half mile of the property but the consultants concluded this was unlikely to have impacted the property (ENGEO, Inc. 2003a).

Follow-up soil and groundwater testing of portions of the site to evaluate nitrate/nitrite contamination was conducted in June 2003. That assessment included testing of eight soil samples and seven groundwater samples. That study found nitrite and nitrate levels well below the USEPA's residential and aquatic toxicity criteria (ENGEO, Inc. 2003d).

GILBERT PARCEL

The Phase I ESA, dated January 15, 2003 was performed by Sequoia Environmental Consulting Services on behalf of Mr. Brent Gilbert (Sequoia Environmental Consulting Services, 2003). The Phase I for the Gilbert Parcel was similar to that performed by ENGEO Inc. on the two parcels to the west and east, but also included an asbestos and lead-based paint survey. The California Environmental Protection Agency (CalEPA) performed air sampling to determine the presence of radon gas. Depth to groundwater was determined to be approximately five feet below surface.

The ESA noted that the property was used for cattle grazing and included some related structures such as a horse and feeding barn and an abandoned shed. Two gas wells managed by Tonka Energy Corp. were located in the east and southeast corners of the property.

BURROUGHS PARCEL

The Phase I ESA, dated January 29, 2003, was performed by ENGEO Inc. on behalf of Mr. Robert Burroughs (ENGEO, Inc. 2003b). The Phase I ESA for the Burroughs Parcel (ENEGO, Inc. 2003b) used the same methodology as for the Emerson Parcel. The ESA noted that most of the property was undeveloped open space. There was a residential/ranch complex and abandoned dairy. Seven gas wells, of which only one was still active, four were idle and two were plugged, and associated structures including storage tanks, were also found on the property.

A additional investigation of the soil and groundwater around the six inactive and one active natural gas wells was also performed by ENGEO Inc. for Mr. Robert Burroughs and is dated July 30, 2003 (ENGEO, Inc. 2003c). The Phase II Natural Gas Well Site Assessment (ENEGO, Inc. 2003b) was performed to follow up on possible areas of concern found in the Phase I. This work included the following field and laboratory investigations:

- Excavation of 53 exploratory test pits 24 to 30 inches in depth across the gas well sites
- Recovery of 14 composite soil samples from the exploratory trenches
- Recovery of four, four-point composite soil samples from the area of the four remaining meter sheds
- Seven *Geoprobe* borings at the well site with groundwater sampling
- Laboratory analysis of the soil and groundwater samples for the following:
    - Test Pits: Total Petroleum Hydrocarbons (TPH) as gas, diesel, motor oil, benzene/toluene/ethylbenzene/xylenes (BTEX); barium and mercury

- Meter Sheds: mercury
- Groundwater Samples from Test Pits: Total Petroleum Hydrocarbons (TPH) as gas, diesel, motor oil, benzene/toluene, ethylbenzene, xylenes (BTEX)

Results and Potential Concerns

EMERSON PARCEL

The Phase I ESA for the Emerson Parcel (ENGEO, Inc. 2003b) did not find any mention of the property or of nearby properties in any agency records consulted, with one exception: the Emerson Dairy was listed on the Contra Costa County Hazardous Substances Database and a request for a Hazardous Material Business Plan was found in a review of the facility file. No other information was available. ENGEO, Inc. found no areas of concern other than the possibility of elevated levels of nitrate in soil and groundwater, given the past use of the property for cattle-raising.

Further testing was carried out of groundwater and soil (ENGEO, 2003d). Results showed nitrate levels higher than established drinking water guidelines, but DWR (2003h) concluded that groundwater beneath the property would not be used for drinking, was anyway unlikely to come into contact with surface water and would be diluted by tidal water on inundation of the site.

DWR (2003c) recommended that ENGEO, on behalf of the site owners, provide additional information on: an abandoned gas well; a water well (and its proper decommissioning); railroad ties and telephone poles that could have been treated with a wood preservative containing arsenic, copper, chromium and zinc; if the pole-mounted transformers ever contained PCBs; characterize the debris piles and recommend methods for their disposal; and perform a cultural resources records search.

The landowners were found to have substantially complied with DWR when DWR (2003d) and Department of General Services (DGS 2003) performed further site inspections in 2003. DWR and DGS concluded that: two sites for gas wells had been drilled but no pipes installed and the locations would be noted on a topographic map; PCBs that were formally present in the pole-mounted transformers had been removed; the solid waste and debris piles had been removed. In-ground fence posts with pressure-treated wood would remain in the ground and would be removed with the other structures when restoration proceeded. DWR made their final inspection of the Emerson parcel on August 26, 2003 (DWR 2003e).

GILBERT PARCEL

The Phase I ESA for the Gilbert Parcel (Sequoia Environmental Consulting Services 2003) did not find any mention of the property or of nearby properties in any agency records consulted with one exception: the California Oil and Gas Well Report listed two gas wells on the property.

Inspection of the gas wells indicated some leaks around joints in the pipes and noted the potential for subsurface contamination. The asbestos and lead-based paint inspection showed that asbestos-containing materials were present in the shed but lead-based paint was not detected. Air sampling did not show any excessive exposure to radon.

DWR (DWR 2003a) recommended Sequoia, on behalf of the site owners, provide additional information on: the gas wells; water well (and its proper decommissioning); chemicals used in the treatment of the wood posts; sewage system used at the single-family residence; historic use and storage

of hazardous materials at the site, in particular 55-gallon drums and pole-mounted transformers that could have contained PCBs; abandoned vehicles and machines and debris piles; onsite treatment and disposal of effluent from cattle-grazing activities; and perform a cultural resources records search.

The landowners were found to have substantially complied with DWR when DWR (2003d) and Department of General Services (DGS, 2003) performed further site inspections in 2003. DWR and DGS concluded that: the three idle gas wells would be plugged and abandoned by the end of 2003; the above-ground fuel tank and all 55-gallon drums had been removed as had any surface residue; the pole-mounted transformers formerly PCBs but the PCBs had been removed; the solid waste and debris piles had been removed; the manure separation area east of the barn and the barn itself had not been used for dairy operations for some time and did not pose any threats to the environment. DWR made their final inspection of the Gilbert parcel on August 26, 2003 (DWR 2003e).

BURROUGHS PARCEL

The Phase I ESA for the Burroughs Parcel (ENGEO, Inc. 2003b) noted the following concerns:

- Soil or groundwater around the structures associated with the natural gas wells might be impacted by hydrocarbons, mercury or barium. A Phase II investigation was recommended (see below).
- Soil near the above-ground fuel tanks might be impacted due to past use of these tanks and this should be investigated further if the tanks were removed.
- Soil near the carport/garage might be impacted due to possible discharges of motor oil, fuels or solvents and this should be investigated further if the structures were removed.
- Asbestos-containing materials and lead-based paint could be contained in the structures and that this should be assessed prior to demolition.
- Septic systems/water wells should be removed in accordance with current regulations.

The Phase II Natural Gas Well Site Assessment (ENGEO, Inc. 2003c) concluded the following:

- There were did no significant petroleum hydrocarbon impacts for near surface soil at the well sites, with the exception of around the active Well #5 (Tonka 6-1). There were visible impacts to soil around the compressor unit at that well site.
- There were no significant barium or mercury impacts with the exception of the meter shed area of Well #7 (Tonka 3-2). The mercury concentration of 40 ppm exceeded both State hazardous waste criteria and the USEPA Preliminary Remediation Goal (23 ppm).
- Detectable petroleum hydrocarbons were reported in groundwater at four of the seven well sites. No BTEX was reported for the seven well sites. The reported diesel/gas concentrations at the well sites of five and seven exceeded the water quality goals established by the Central Valley Regional Water Quality Control Board. According to ENGEO, Inc, because the shallow aquifer underneath the Burroughs site was unlikely to be considered a municipal water source, the hydrocarbon contamination in groundwater was not a significant environmental concern.

DWR (2003b) recommended ENGEO provide, on behalf of the site owners, additional information on: the gas wells; water wells (and their proper decommissioning); septic systems from the single-

family residence and an asbestos and lead-based paint survey if they are demolished; historic and current use of hazardous materials at the site (such as the 55-gallon drums of petroleum products); an inventory made of the vehicles and abandoned farm equipment and characterization of the composition of the waste piles be characterized; onsite treatment and disposal of the effluent from the dairy and cattle-grazing activities; a complete inventory of all material stored at the dairy farm and related structures; and a cultural resources records search.

The landowners were found to have substantially complied with DWR when DWR (2003d) and Department of General Services (DGS 2003) performed further site inspections in 2003. DWR and DGS found that: the idle gas wells on the property would be plugged and abandoned within five years and the mercury and petroleum contamination identified at two of the drilling pads would be removed prior to the close of escrow; the chemicals used in the ongoing farming operation would be removed on termination of the lease and other chemicals had already been removed; surface-contaminated soil beneath the above-ground fuel tanks had been removed but further remediation was planned; abandoned vehicles and machinery had been removed and those in active use could remain for the time being; wood debris piles had been removed; there was no evidence of animal waste concentrations because the site had not been used as a dairy for years; the 30-gallon drum had been removed from the dairy farm and all of the buildings had been emptied and cleaned.

The landowners contracted with ENGEO to remove the petroleum-contaminated soil at the above-ground tank site and the petroleum/mercury-contaminated soil at the well site (DWR 2003f). Phase II remediation activities on the Burroughs property were completed and a final inspection made October 10, 2003 (DWR 2003e). The petroleum and petroleum/mercury-contamination soil was excavated and removed at the above-ground fuel tank and gas well site. Residual petroleum from beneath the tank was considered to be at levels too low to be of significant concern.

Soil Sampling of the Ironhouse Parcel

Soils from the Ironhouse parcel were analyzed by Stellar Environmental Solutions, Inc. (SES) in August 2006. Samples were taken from above two feet above mean sea level to obtain information about the soil that would be used to fill areas of open water if Alternatives 2 or 3 are carried out in restoration of the main part of the site. Three vertical sample sets were collected at five locations for a total of 15 samples analyzed. The locations for sampling included areas known by the Sanitary District to have received proportionately more, or less, wastewater. As results were relatively similar (despite the different lithologies of the samples), it was concluded by SES that the samples were representative of the site in general and no further sampling was necessary.

Samples were analyzed for CA Title 22 (CAM 17) Metals (antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium and zinc) semi-volatile organic compounds (SVOCs) and polynuclear aromatic hydrocarbons (PAHs); chlorinated herbicides; ammonia (as nitrogen) and chloride; and total petroleum hydrocarbons (motor oil range). No SVOCs, PAHs or herbicides were detected above the reporting limits. Petroleum hydrocarbons (diesel and motor oil grade) were reported at low concentrations (averaged 18.5 mg/kg), dominantly in the near surface (upper one foot) of soil. Petroleum hydrocarbons were found at low concentrations near to the ground surface. Metals were present at concentrations too low to be of concern according to criteria for reuse of dredged materials established by San Francisco Regional Water Quality Control Board (SFRWQCB, 2000).

A fuller discussion of the analyses of Ironhouse parcel soil is included in Section 3.2 on Water Quality because the Ironhouse soils may be used as fill for the main part of the site and may therefore affect water quality at that location.

Vectors

The Dutch Slough Restoration Project and Related Project sites support extensive seasonal and freshwater perennial wetlands similar to those of managed wetlands in the Central Valley and Suisun Marsh. They are also substantially similar in terms of potential mosquito breeding habitat. Mosquito production in wetland habitats in the Dutch Slough setting, however, differs in being directly adjacent to proposed extensive residential development (sensitive human receptors) on adjacent parcels, and being integrated with a recreational community park surrounded by tidal wetlands or managed wetlands (depending on alternatives and design options). Mosquito species differ in their potential to act as vectors for human diseases known to occur or have occurred in California, such as West Nile Virus, malaria, encephalitis viruses, and other pathogens.

Depending on seasonal and environmental conditions and the particular mosquito species involved, it generally takes from three to twelve days for a mosquito to complete its life from developed egg to early adult stage. In general, as temperature increases, the number of days required from hatching to emergence as an adult decreases. The potentially rapid life-cycle of mosquitoes can result in rapid, eruptive mosquito populations related to relatively short-term variations in marsh flooding and emergence, or seasonal tidal cycles.

There are four principal pest mosquitoes (*Ochlerotatus melanimon, Culex tarsalis, Culex erythrothorax, Anopheles freeborni*) that can be produced in freshwater (or fresh-brackish) perennial and seasonal marshes, and which been the subjects of control efforts by Mosquito Vector Control Districts (MVCDs) in the Central Valley. These four species can be categorized by life history and associated wetland habitats.

FLOODWATER MOSQUITOES *(OCHLEROTATUS MELANIMON)*

Floodwater mosquitoes have been identified as a primary nuisance species and as secondary or "bridge" vectors for California encephalitis virus and western equine encephalitis, and are considered moderately effective as vectors of West Nile Virus. The life cycle of the floodwater mosquito begins with flooding of ground that has undergone a dry period. Females lay their eggs singly on drying soil of seasonal wetlands, in leaf litter, in cracks in the soil, or at the bases of grasses and other plants in areas that have been flooded previously. Once flooded, eggs that were laid during the previous dry cycle hatch, pupate, and emerge as adults. Eggs are very drought resistant. Within the project site, floodwater mosquitoes are likely to be risks associated with seasonal wetlands that undergo seasonal or periodic wetting/flooding/drying cycles, such as irrigated pasture, alkali-meadow, freshwater marshes in drought years, or ruderal areas.

STANDING WATER MOSQUITOES (CULEX TARSALIS, CULEX ERYTHROTHORAX, ANOPHELES FREEBORNI)

Culex tarsalis is considered the primary vector for western equine encephalomyelitis virus to humans and horses. It is the primary vector for St. Louis encephalitis virus in humans. *Culex tarsalis* has also been identified as a primary vector of West Nile virus in the western United States. Females lay their eggs on the water surface in rafts of 100-150 eggs. Eggs hatch within one day after deposition.

The larval stages can be found in almost any source of standing, sheltered water in marshes. During the summer, development from egg to adult takes about seven to nine days. Peak populations of *C. tarsalis* occur in late June or early July, but may continue into late summer. Adults can emerge throughout the summer and fall in marshes that have been flooded for more than two or three weeks. Within the existing project area, *C. tarsalis* may be associated with seasonal ponds (freshwater marsh). Within proposed restoration habitats, *C. tarsalis* could be associated with managed open water areas or isolated, marginal ponded habitats within restored freshwater tidal marsh.

Culex erythrothorax is highly susceptible to West Nile Virus infection and may act as a bridge vector of this virus in California. These mosquitoes prefer to deposit their egg rafts within thick aquatic or marsh vegetation in ponds, often over relatively deep water. The larvae can be difficult to sample because they are extremely sensitive to physical disturbances (e.g. vibrations from the collector's footsteps or dipper), and tend to remain submerged longer than other mosquito species after being disturbed. They tend to remain sheltered among dense shoots and foliage of wetland plants, making detection and treatment difficult. There they remain relatively inaccessible to mosquito predator fish. Within the existing project area, *C. erythrothorax* may be associated with seasonal ponds (freshwater marsh). Within proposed restoration habitats, *C. erythrothorax* could be associated with margins of managed open water areas, isolated, marginal ponded habitats, or poorly drained areas within restored freshwater tidal marsh.

Anopheles freeborni is a potential a vector of malaria in the western United States, where three major outbreaks occurred in the last 40 years. This species also occurs in the Central Valley and is numerous during the summer, peaking in late July or August. Ricefields, and semi-permanent and permanent wetlands are the primary production areas for this species, although the immature stages are also found in ditches, seepages, and sloughs. Females lay their eggs singly on the surface of the water where they hatch approximately 24 hours later. In autumn, females enter a semi-dormant or resting state (diapause). In winter, warm day temperatures may cause them to become active and seek blood meals. After obtaining a blood meal, many females resume their over-wintering state until April or May when they begin laying eggs once more. The females will readily bite humans and livestock. Within the existing project area, *Anopheles freeborni* may be associated with seasonal ponds (freshwater marsh). Within proposed restoration habitats, *Anopheles freeborni* could be associated with margins of managed open water areas, isolated, marginal ponded habitats, or poorly drained areas within restored freshwater tidal marsh.

3.15.2 Impacts and Mitigations

Significance Criteria

Criteria for determining significant impacts are based upon the CEQA Guidelines (Appendix G) and professional judgment. These guidelines state that a project would have a significant impact on to public health and safety if it:

- Creates a significant health or safety hazard to workers associated with the construction of the proposed park and wetlands.
- Creates a significant health hazard to the public or sensitive sub-populations (e.g., children) through the routine use or transport of hazardous materials.

- Creates a significant hazard to workers or the public through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

As noted in the introduction to this section, water quality impacts associated with soil contamination are addressed in that section of the EIR.

Criteria for significance of mosquito vector impacts would include:

- Changes in the demand for MVCD activities within the project area that would consistently exceed normal (long-term average) costs for managing the Dutch Slough wetlands, adjusted for residential population (receptor) increases beyond the control of the project.
- Substantial changes in the type or frequency of MVCD activities (monitoring or treatment) or equipment needed to maintain existing levels of mosquito production.
- Epidemiologically substantial changes in the frequency of mosquito-born illnesses that correspond with proximity of residence to the project site, or frequency of visits to the site.

Alternative 1: Minimum Fill

IMPACT 3.15.1-1: EFFECTS OF DUTCH SLOUGH RESTORATION PROJECT AREA SOILS CONTAMINATION (ALL OPTIONS)

Workers on the Dutch Slough Restoration Project site could be exposed to hazardous conditions associated with natural gas wells on the property. In addition, as described above, some higher levels of soils contamination were found in association with those wells on the Burroughs parcel; a detailed assessment of the natural gas well sites on the Gilbert parcel has not yet been performed, but preliminary assessment indicated that some contamination may occur near those wells. Exposure to high nitrate levels on the former cattle waste pond area on the Emerson parcel would not have any human health effects.

MITIGATION 3.15.1-1: EFFECTS OF SOILS CONTAMINATION (ALL OPTIONS)

A. The Dutch Slough Restoration Project shall comply with the ESA recommendations regarding the natural gas well sites. Specifically, the remaining appurtenances at the plugged and abandoned wells shall be removed, mercury impacted soils at Well Site #7 shall be excavated and removed for disposal and hazardous materials management practices at active Well Site #5 shall be reviewed: Petroleum impacted soils should be excavated and removed for disposal. The status of the remaining idle well sites (#3, #8, #11, #16) shall be determined and if they are not to be retained for future operation they shall be properly plugged and abandoned.

B. Prior to development of the Dutch Slough Restoration Project, a Phase II ESA shall be performed to identify any hazardous materials issues associated with natural gas wells on the Gilbert parcel, and any remediation recommendations in that report shall be implemented.

C. Prior to development of the City Community Park, Phase II ESA shall be performed to identify any hazardous materials issues associated with the former cattle waster pit on the Emerson parcel, and any remediation recommendations in that report shall be implemented.

SIGNIFICANCE AFTER MITIGATION

Implementation of mitigation 3.15.1-1, above, would reduce this impact to a less than significant level.

IMPACT 3.15.1-2: HEALTH RISKS ASSOCIATED WITH DEMOLITION ACTIVITIES (ALL OPTIONS)

As noted in the Phase I and Phase II environmental studies prepared for various site parcels, asbestos-containing materials and lead-based paint could be contained in the structures proposed for demolition to clear the site for Dutch Slough Restoration Project and City Community Park development. Most of these structures would be associated with the City Park property. There are no structures on the Ironhouse Project site.

MITIGATION 3.15.1-2: HEALTH RISKS ASSOCIATED WITH DEMOLITION ACTIVITIES (ALL OPTIONS)

All structures proposed for demolition shall be assessed for asbestos and lead-based paints, and all recommendations of those evaluations shall be implemented. Details of these evaluations for the City Community Park property shall be included in the subsequent CEQA documentation for the park .

SIGNIFICANCE AFTER MITIGATION

Implementation of mitigation 3.15.1-2, above, would reduce this impact to a less than significant level.

IMPACT 3.15.1-3: HEALTH EFFECTS TO WORKERS ASSOCIATED WITH DISTURBANCE OF SOILS FROM IRONHOUSE PARCEL (ALL OPTIONS)

Under Alternative 1, no additional fill material would be imported to the Dutch Slough Restoration Project site, although the soils would be disturbed in the Ironhouse parcel from the restoration of the Ironhouse Project. Based on the preliminary soil sampling results form the Ironhouse parcel, this impact is considered insignificant.

IMPACT 3.15.1-4: HEALTH EFFECTS FROM MOSQUITOES

The specific design or habitat features of wetland restoration alternatives, including specific design options, that are most relevant to human health relate to (a) mosquito production (frequency, type, abundance and location of mosquitoes produced), and (b) human exposure to mosquitoes by either dispersal of mosquitoes from source areas, or entry of source areas (marshes, sloughs) by humans.

Specific marsh habitat features that are most likely to be risks for excessive production of mosquitoes include:

(a) Poorly drained, flat to gently sloping sheltered marsh areas with gradually fluctuating water levels, low turbulence, and rich organic matter from decomposition. Marsh plains edged by artificial berms that obstruct sheetflow drainage across marshes are likely to be associated with this mosquito subhabitat.

(b) Areas of dense marsh vegetation with minimal access to fish predators, strong surface currents, or exposure to wind-generated waves.

(c) Areas of gradual seasonal fluctuation in water levels, alternating between wetted and desiccated ground.

Conversely, marsh habitat features that are inherently likely to constrain mosquito production are associated with strong daily tidal fluctuation and currents, exposure to surface turbulence (wind-waves, currents) of open water surfaces, and exposure to fish predators that are widespread in tidal sloughs. Unlike managed marshes with artificial engineering designs, the basic purpose of tidal restoration is to replicate as much of the ecological structure, composition, and patterns of natural or historic tidal marshes to the greatest extent feasible. This may limit the range of compatible marsh design features (or Best Management Practices) for mosquito management and that are traditionally applied to managed marshes in the Central Valley and Suisun Marsh.

Dutch Slough Restoration Project alternatives and options differ in the extent to which they contribute to potential increases or decreases of mosquito production relative to existing conditions. Generally, deep (over 2 ft) open water areas are likely to be unproductive of mosquitoes. Low intertidal marshes (tule marshes with bed elevations near Mean Low Water) with full tidal range are also unlikely to produce mosquitoes. Marsh types or options that have variably higher risk of mosquito production would include: (a) interior areas of mid-intertidal or high intertidal marsh, remote from tidal channels; (b) zones of wrack (tidal debris) accumulation within the marsh plain or marsh edge, particularly at downwind ends (corners) marshes or near topographic high areas; (c) channel reaches that develop obstructed circulation (e.g., blockage by debris jams); (d) marsh areas that are exposed to flood deposits of sediment leaving variable topography, drainage, and debris; (e) any constructed seasonal wetlands or isolated ponds.

Alternative 1 includes the greatest areas of open water and terrestrial habitat, and thus the least potential for mosquito production. Alternative 1 is likely to reduce levels of mosquito production below those of existing conditions because it significantly reduces seasonal wetland areas and unmanaged (slow seasonal drawdown) nontidal freshwater marsh. Some mosquito production would occur along gently sloped margins of tidal marsh (essential to restoration of native species diversity in restored tidal marsh), and marsh plains edged by berms. Some mosquito production (possibly above existing conditions) may be caused by non-tidal open water management options. Alternative 1 would increase exposure of humans to mosquito production compared with existing conditions by increasing public access and exposure time to wetland habitats. The exposure would vary with time of day, temperature, humidity, and wind conditions (generally greatest around dusk in summer).

The Ironhouse Project would create a narrow, slender tidal marsh unit that would tend to trap flood debris and sediment, and has a high perimeter:area ratio compared with the main Dutch Slough Restoration Project area. It is designed to maximize marsh plain area, and it is drained by a single elongated channel. This unit would have a substantially higher potential for mosquito production overall and per unit area compared with the main units. It is also directly adjacent to and downwind (thermal Bay-Delta breezes) of a newly developed residential area.

MARSH CREEK DELTA RELOCATION OPTIONS

The Marsh Creek Delta relocation options (see Figure 2-13) vary in the degree to which new flood deposits (coarse sediment, debris jams) across marsh plains with pre-existing tidal channels may cut off isolated channel segments (creating channel pools). Option 3 has the greatest potential to create coarse sediment/debris obstructions or dams in front of the greatest total length of constructed

channels, thus creating the greatest amount of poorly circulating, sheltered vegetated pool habitat for mosquito breeding. Option 1 has the least potential to impound tidal channel flows, but has high potential to create high deltaic marsh plains (effectively seasonal marsh) near the limits of tide (low tidal energy). Option 2 has intermediate but high potential for channel obstruction and impoundment by deposition of coarse flood sediment and debris.

OPEN WATER MANAGEMENT OPTIONS

Options for open water management based on tidal flows (skeletal marsh channels, deep subtidal, shallow subtidal with native SAV planting) all have low potential for mosquito production, because all include extensive, turbulent, unsheltered open water surfaces with significant daily tidal range. Managed nontidal options (managed pond, subsidence reversal/managed tule marsh) have substantial potential to produce mosquitoes if they are not managed according to regional Best Management Practices for mosquito abatement.

MITIGATION 3.15.1-4.1: ADAPT AND APPLY REGIONAL (CENTRAL VALLEY/SUISUN) BEST MANAGEMENT PRACTICES (BMPS) FOR MANAGED MARSHES TO TIDAL MARSHES

Adapt BMPs for managed marsh to be compatible with basic ecological restoration objectives of freshwater tidal marsh restoration in the western Delta, following applicable precedents from San Pablo Bay (Petaluma, Napa-Sonoma) and Suisun and Grizzly Bay marshes, in consultation with Contra Costa, Solano, and Marin-Sonoma MVCDs, the California Department of Fish and Game, and the U.S. Fish and Wildlife Service. Add tidal marsh MVCD activities to regional permits for MVCD activities in wetlands in the Central Valley.

MITIGATION 3.15.1-4.2: ADAPT AND APPLY REGIONAL (CENTRAL VALLEY/SUISUN) BEST MANAGEMENT PRACTICES (BMPS) FOR MANAGED MARSHES TO OPEN WATER MARSHES

BMPs are habitat-based strategies that can be implemented when needed for mosquito control in managed wetlands. These strategies represent a range of practices that wetland managers can incorporate into existing habitat management plans or in the design of new wetland restoration or enhancement projects. Ideally, BMPs can be used to decrease the production of mosquitoes and reduce the need for chemical treatment without significantly disrupting the ecological character, habitat function, or wildlife use in managed wetlands. Not all BMPs would be appropriate for a given wetland location or set of circumstances.

TIMING OF MANAGED MARSH FLOODING AND DRAWDOWN (NONTIDAL MANAGED OPEN WATER OPTIONS). Timing of flooding and drawdown shall be coordinated with local MVCD, adapted to current-year temperature, rainfall patterns, and mosquito vector risks, to minimize mosquito production and vector risks.

RAPID FLOODING AND DRAWDOWN OF MANAGED MARSH. Marshes shall be flooded and drawn down (emerged bed) as quickly as operational controls allow.

WATER CONTROL. Once wetlands have been flooded, water surface elevations shall minimally fluctuate prior to drawdown, except during winter periods of low mosquito production. Minimal fluctuation is based on the need to circulate water (maximize turnover). Marsh submergence depths shall be managed to maximize areas with minimal initial flooding depths of two feet (twenty four inches).

WETLAND DESIGN FEATURES TO REDUCE MOSQUITO PRODUCTION. Managed wetland edges shall be constructed to enable efficient access by MCVD field crews for monitoring and treatment. Edge slopes of managed nontidal marsh areas shall be steeper than to 4:1 (horizontal:vertical). Open water areas with sufficient fetch and wind-wave turbulence to minimize mosquito production shall be interspersed within managed marsh, at least 20% of total area. Floating aquatic vegetation shall be actively suppressed in open water areas within managed marsh.

MITIGATION 3.15.1-4.3: MODIFY DESIGN OF IRONHOUSE RESTORATION PROJECT (IRONHOUSE PROJECT ONLY)

Modify design of Ironhouse Project to minimize trapping of coarse sediment and debris (reduction or elimination of overflow zones), and to minimize recurrent creation of complex backwater marsh areas with poor drainage and difficult access for MCVD field crews. Enlarge channel cross-section area to improve tidal drainage and circulation. Install coarse debris screens at the single channel mouth at Marsh Creek to minimize debris jams that may create backwater marsh areas or channel pools (standing water mosquito habitat). Pre-install coarse woody debris in this marsh unit to compensate for wildlife habitat loss due to reduction in variable-size debris.

IMPACT SIGNIFICANCE AFTER MITIGATION: Less than significant

Alternative 2: Moderate Fill Alternative

IMPACT 3.15.2-1: EFFECTS OF DUTCH SLOUGH RESTORATION PROJECT AREA SOILS CONTAMINATION (ALL OPTIONS)

This impact would be similar to that of Alternative 1.

MITIGATION 3.15.2-1: EFFECTS OF DUTCH SLOUGH RESTORATION PROJECT AREA SOILS CONTAMINATION (ALL OPTIONS)

Same as for Alternative 1

SIGNIFICANCE AFTER MITIGATION

Implementation of mitigation 3.15.1-1, above, would reduce this impact to a less-than-significant level.

IMPACT 3.15.2-2: HEALTH RISKS ASSOCIATED WITH DEMOLITION ACTIVITIES (ALL OPTIONS)

This impact would be similar to that of Alternative 1.

MITIGATION 3.15.2-2: HEALTH RISKS ASSOCIATED WITH DUTCH SLOUGH RESTORATION PROJECT AREA DEMOLITION ACTIVITIES (ALL OPTIONS)

Same as for Alternative 1

SIGNIFICANCE AFTER MITIGATION

Implementation of mitigation 3.15.1-2, above, would reduce this impact to a less than significant level.

IMPACT 3.15.2-3: HEALTH EFFECTS TO WORKERS ASSOCIATED WITH DISTURBANCE OF SOILS FROM IRONHOUSE PARCEL (ALL OPTIONS)

Under Alternative 2, some fill material would be imported from the Ironhouse site to the Dutch Slough site. However, as no contaminants of concern have been found in excess of criteria levels, this is not considered significant.

IMPACT 3.15.2-4: HEALTH EFFECTS FROM MOSQUITOES

This alternative includes extensive open water areas with minimal mosquito production, but it also includes extensive marsh plains filled to mid-intertidal to upper intertidal elevations. Much of the marsh plain in Gilbert and Burroughs parcels is intersected by berms that are designed to act as drainage divides for short-term adaptive management experiments related to fish habitat quality. Berm edges may restrict marsh sheetflow and produce areas of poorly drained marsh surface that would increase risks of mosquito production, especially after unusually high tides. The interaction between the extensive constructed marsh plain and channel system of the Emerson Parcel, and Marsh Creek delta relocation options, also distinguishes Alternative 2 in elevating mosquito impact potential. (See discussion of Marsh Creek Relocation option, above).

MITIGATION 3.15.2-4: HEALTH EFFECTS FROM MOSQUITOES

Same as for Alternative 1, but with the following additions: (a) minimize or eliminate artificial berms within middle or high marsh plains; replace their drainage divide functions with temporary structures that restrict fish movement without impounding water on the marsh surface, such as mesh or geo-textile fabric fences; (b) adaptively modify marsh plain drainage patterns with amphibious excavation/dredging equipment to expose poorly drained backwater marsh areas to adequate tidal circulation and mosquito predator fish access; (c) Orient the Marsh Creek delta so that flood sediment deposition does not obstruct, occlude, or cut off tidal flows from channels and create standing water mosquito habitat.

SIGNIFICANCE AFTER MITIGATION

Less than significant.

Alternative 3: Maximum Fill

IMPACT 3.15.3-1: EFFECTS OF DUTCH SLOUGH RESTORATION PROJECT AREA SOILS CONTAMINATION (ALL OPTIONS)

This impact would be similar to that of Alternative 1.

MITIGATION 3.15.3-1: EFFECT OF DUTCH SLOUGH RESTORATION PROJECT AREA SOILS CONTAMINATION (ALL OPTIONS)

Same as for Alternative 1

SIGNIFICANCE AFTER MITIGATION

Implementation of mitigation 3.15.1-1, above, would reduce this impact to a less-than-significant level.

IMPACT 3.15.3-2: HEALTH RISKS ASSOCIATED WITH DEMOLITION ACTIVITIES (ALL OPTIONS)

This impact would be similar to that of Alternative 1.

MITIGATION 3.15.3-2: EFFECTS OF DUTCH SLOUGH RESTORATION PROJECT AREA SOILS CONTAMINATION (ALL OPTIONS)

Same as for Alternative 1

SIGNIFICANCE AFTER MITIGATION

Implementation of mitigation 3.15.1-2, above, would reduce this impact to a less than significant level.

IMPACT 3.15.3-3: HEALTH EFFECTS TO WORKERS ASSOCIATED WITH DISTURBANCE OF SOILS FROM IRONHOUSE PARCEL (ALL OPTIONS)

Under Alternative 3, some fill material would be imported from the Ironhouse site to the Dutch Slough Restoration Project site. However, as no contaminants of concern have been found in excess of criteria levels, this is not considered significant.

IMPACT 3.15.3-4: HEALTH EFFECTS FROM MOSQUITOES

This alternative includes extensive open water areas with minimal mosquito production only on the Emerson Parcel. It supports extensive marsh plains filled to mid-intertidal to upper intertidal elevations (relatively high mosquito production risk or potential) throughout the Gilbert Parcel, adjacent to the City Community Park. Much of the marsh plain in Gilbert and Burroughs parcels is also intersected by berms that are designed to act as drainage divides for short-term adaptive management experiments related to fish habitat quality. Berm edges may restrict marsh sheetflow and produce areas of poorly drained marsh surface that would increase risks of mosquito production, especially after unusually high tides. The interaction between the extensive constructed marsh plain and channel system of the Emerson Parcel, and Marsh Creek delta relocation options, also distinguishes Alternative 3, like Alternative 2 in, elevating mosquito impact potential. (See discussion of Marsh Creek Relocation option, above)

MITIGATION 3.15.2-4: HEALTH EFFECTS FROM MOSQUITOES

Same as Alternative 2.

SIGNIFICANCE AFTER MITIGATION

Less than significant.

Alternative 4: No Project

IMPACT 3.15.4-1: EFFECTS OF EXISTING CONTAMINATED SOILS

Soils contamination would remain as present, and may continue to be transported into the groundwater. No exposure to construction workers or site users is likely because no excavation of materials or public use of the site is proposed. Therefore this impact would be less than significant, and no mitigations would be required.

IMPACT 3.15.4-2: HEALTH RISKS ASSOCIATED WITH DEMOLITION ACTIVITIES (ALL OPTIONS)

No demolition would occur under this alternative, so no demolition-related health risks would occur.

IMPACT 3.15.4-3: HEALTH EFFECTS TO WORKERS ASSOCIATED WITH DISTURBANCE OF SOILS FROM IRONHOUSE PROJECT SITE (ALL OPTIONS)

No soils disturbance would occur under this alternative, so no soil-disturbance health risks would occur.

IMPACT 3.15.4-4: HEALTH EFFECTS FROM MOSQUITOES

There would be no change in mosquito production and associated health risks compared with existing conditions.